

Appl. No. 10/046,615  
Amendment dated October 14, 2003  
Reply to Office Action of April 11, 2003

### **REMARKS/ARGUMENTS**

Applicants respectfully request reconsideration and reexamination of the above-referenced applicaiton in view of the above-presented amendments and the following remarks.

#### **Status of the Claims:**

Claims 1 through 21 are pending in the subject patent application. Claim 22 through 28, inclusive, have been cancelled in response to a restriction requirement.

#### **Amendments to Claims and Specification:**

Applicant has amended the Abstract of the Disclosure and the Specification (pages 2 and 3) and Claims 1 and 4 to more clearly and distinctly enumerate the structure of the repeating units of the poly(arylene ether) polymers of the present invention. More particularly, the structures have been amended to make clear that only one oxygen atom separates Ar<sub>2</sub> and Ar<sub>3</sub> and Ar<sub>4</sub> with another Ar<sub>1</sub>. For clarity, Applicant has used double brackets instead of a strikethrough line to delete the original structure. Finally, groups G<sub>1-8</sub> have been realigned with groups Ar<sub>1-4</sub>.

Claims 14 and 15 have been amended to clarify that the subject structures represent units m and n of the polymer. While the meaning of the claims as originally presented is clear to one of ordinary skill in the art, the structure, as amended, is now presented in the format of the repeating units presented on pages 7 and 8 of the instant Specification and the references cited as prior art against the claims of this application. The amendments to the Specification and claims do not present new matter.

The Examiner has objected to the disclosure based upon informalities pertaining to the polymer repeat units on page 3 and on pages 7-8. The Examiner states that each repeat unit on page 3 has three ether groups whereas each unit on pages 7-8 has one two ether groups. Applicant respectfully submits that the objection has been overcome based upon the

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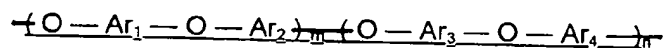
amendments made to the structures presented on page 3 and request the Examiner to withdraw the objection.

The Examiner has objected to Claims 1, 4 and 14 and 15 based upon informalities pertaining to the polymer repeat units. Claims 1 and 4 have been amended as previous discussed. Claims 14 and 16 have been amended to define the subject structures as represently the "m" and "n" units of the polymer. The amendment does not present new matter. Applicant respectfully submits that the Claims 1, 4 and 14 and 15 have been amended to overcome the Examiner's stated objections.

#### **Discussion of the Claimed Invention (as amended)**

The present invention relates to poly(arylene ether) polymers, and more particularly to grafting olefinic functional groups to the backbone of the poly(arylene ether) polymers to provide cross-linkable polymers having particularly utility as coatings and adhesives with high glass transition temperatures and low moisture uptake.

The polymers according to Claim 1 (currently amended) present repeat units of the following structure:



where Ar<sub>1</sub>, Ar<sub>2</sub>, Ar<sub>3</sub>, and Ar<sub>4</sub> are identical or different aryl radicals, m is 0 to 1, n is 1-m, and **at least one of the aryl radicals is grafted to at least one unsaturated group that is non-aromatic** and is adapted to crosslink at a curing temperature below 200°C without producing volatiles during curing and without providing functional groups after curing.

Suitable non-aromatic, unsaturated groups are selected from the group consisting of an alkylene radical, an alkyldiene radical an α-hydroxyalkylene radical and an α-hydroxyalkyldiene radical (see Claim 8).

The advantages of the polymers of the claimed invention over the polymers of the prior art are set forth in the Specification (page 3, lines 12 through 19) which states:

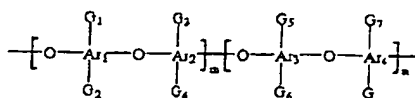
The aforementioned drawbacks of the prior art are overcome by grafting onto poly(arylene ether) polymers unsaturated groups (i.e., grafts (G)), which can crosslink at a curing temperature of less than 200°C. The invention thus relates to specific poly(arylene ether) polymers and compositions containing them, their use as adhesives, sealants, dielectrics, passivation layers, coatings or in photo-imaging, a microelectronic device comprising the same, a method of crosslinking the polymers, and an adhesive comprising such poly(arylene ether) polymers, optionally in combination with a reactive diluent. Curing can be accomplished by heating wherein the polymer curing is initiated with UV radiation. **(emphasis added)**

**Rejection Under 35 USC § 103:**

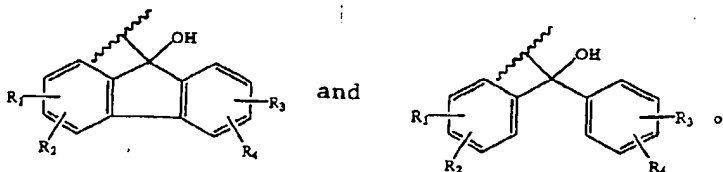
Claims 1 through 21 are rejected under 35 U.S.C. § 102(a) as being unpatentable over United States Patent 6,060,170, (the "**Burgoyne '170 Patent'**"), or European Patent Application EP 0758664 A1, ("the '**664 Application'**") or European Patent Application EP 0755957 A1 ("**the '957 Application'**"), each assigned to Air Products and Chemicals, Inc.

**United States Patent 6,060,170**  
 (the "**Burgoyne '170 Patent'**")

The Burgoyne '170 Patent discloses a poly(arylene ether) polymer having a graft that can be thermally induced to crosslink the polymer wherein the polymer is represented by the structure:



Wherein m=0 to 1.0 and n=1.0-m; and Ar<sub>1</sub>, Ar<sub>2</sub>, Ar<sub>3</sub> and Ar<sub>4</sub> are individually Arylene radicals, and G<sub>1-8</sub> are individually,



and mixtures thereof. (remainder of the structural definition omitted herein).

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The poly(arylene ethers) of the claimed invention require (1) at least one "G" group to be "an unsaturated group that is non-aromatic" and (2) adapted to crosslink at a curing temperature below 200°C without producing volatiles during curing and without providing function groups after curing. In contrast, the "G" groups of the Burgoyne '170 Patent are not unsaturated non-aromatic groups. More particularly, the Burgoyne '170 Patent states that G may be a hydrogen atom or either of two aromatic groups. The Burgoyne '170 Patent fails to teach or suggest modifying the G group from a hydrogen atom or an aromatic group to provide the G groups of the present invention which are "unsaturated groups that are non-aromatic and adapted to crosslink at a curing temperature below 200°C. The Burgoyne '170 Patent fails to teach or suggest a single G group that is an "unsaturated non-aromatic group". Therefore, Applicant respectfully submits that the Examiner has not established a prima facie case of obviousness and the Applicant respectfully requests the Examiner to withdraw the rejection of the enumerated claims in view of The Burgoyne '170 Patent.

European Patent Application EP 0758664 A1  
("the '664 Application")

The '664 Application discloses poly(arylene ethers) in which the respective Ar groups are not substituted (by analogy, the G groups of The '664 Application are represented by hydrogen atoms. Thus, the "G" groups of The '664 Application are not "unsaturated groups that are non-aromatic" as required by the claimed invention. The '664 Application fails to teach or suggest modifying the G groups from a hydrogen atom to provide the G groups of the present invention which are "unsaturated groups that are non-aromatic" and adapted to crosslink at a curing temperature below 200°C. Therefore, Applicant respectfully submits that the Examiner has not established a prima facie case of obviousness and the Applicant respectfully requests the Examiner to withdraw the rejection of the enumerated claims in view of The '664 Application.

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**European Patent Application EP 0755957 A1**  
**("the '957 Application")**,

**The '957 Application** discloses poly(arylene ethers) where the respective Ar groups are "**non-functionalized divalent arylene radicals**" whereas the Ar groups of the claimed invention are functionalized with at least one "G" group defined as "an unsaturated group that is non-aromatic" and (2) adapted to crosslink at a curing temperature below 200°C without producing volatiles during curing and without providing function groups after curing. **The '957 Application** fails to teach or suggest modifying the G groups from a non-functionalized divalent arylene radical to provide the G groups of the present invention which present at least one "unsaturated group that is non-aromatic and adapted to crosslink at a curing temperature below 200°C. Therefore, Applicant respectfully submits that the Examiner has not established a prima facie case of obviousness and the Applicant respectfully requests the Examiner to withdraw the rejection of the enumerated claims in view of **The '957 Application**.

**Summary**

Applicants respectfully submit that the rejections and objections set forth by the Examiner have been overcome and Applicants request favorable reconsideration and prompt allowance of the pending claims.

Respectfully submitted,



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